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ELECTRONIC MARKETS AND INTELLIGENT AGENTS: AN EXPERIMENTAL STUDY OF THE ECONOMICS OF ELECTRONIC COMMERCE

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The increasing popularity of the Internet and the World Wide Web (WWW) has been fueling the rise and development of a global electronic marketplace. Electronic commerce applications in such a global electronic marketplace typically encompass business-to-consumer, business-to-business, and intra-business activities.

This research focuses on WWW-based, business-to-consumer retailing. Electronic retailing on the Internet is typically performed through standard online storefronts (e.g., Absolutely Fresh Flowers), specialized online retailers (e.g., Amazon.com), and online megastores (e.g., NetMarket) (Hoffman, Novak and Chatterjee 1996; *The Economist* 1997). Standard online storefronts offer direct sales of an individual vendor's range of products. They are similar to "single-source electronic sales channels" as defined by Malone, Yates and Benjamin (1989). Specialized online retailers and online megastores offer cross-organizational or cross-national connections such that they include product offerings from a number of competing sellers. These specialized online retailers and the online megastores correspond to electronic markets as discussed by Malone, Yates and Benjamin. Unlike traditional retailing, WWW-based retail commerce provides consumers with a unique ability to use intelligent agents (comparison-shopping agents) to automate the search for price and other product information across multiple merchants simultaneously (Crowston 1996; Doorenbos, Etzioni, and Weld 1997). The use of such agents has been touted to reduce buyers' search costs across standard online storefronts, specialized online retailers, and online megastores, and to transform a diverse set of offerings into an economically efficient market (Bakos 1997; Crowston 1996).

Despite the important role intelligent agents play in electronic commerce, no systematic research has been conducted to date to understand the impact of intelligent agents on market trading outcomes and how these impacts will differ across commodity and differentiated product markets. Products in commodity markets are essentially identical across many different sellers; buyers in such markets would typically choose to transact with the seller with the lowest total costs (Bakos 1997). In a differentiated market, products vary in terms of quality or cater to different consumer preferences (Carlton and Perloff 1994). This study focuses on the buyer's search cost in three contexts: the type of market (single-source electronic sales channel vs. electronic markets), the type of product (commodity vs. differentiated products), and the method of information search (the presence vs. the absence of intelligent agents). Specifically, this research seeks to answer the following questions:

1. What are the economic effects of market trading of commodity and differentiated products in single-source electronic sales channels and electronic markets?
2. Can the usage of intelligent agents improve market trading outcomes in single-source electronic sales channels and electronic markets?

Type of Market Organization	Type of Product Market	Use of Intelligent Agent	
		Presence of Intelligent Agent	Absence of Intelligent Agent
Single-source Electronic Sales Channel	Commodity	2 sessions	2 sessions
	Differentiated	2 sessions	2 sessions
Electronic Market	Commodity	2 sessions	2 sessions
	Differentiated	2 sessions	2 sessions

Figure 1. Research Design

3. Will the impact of intelligent agents on market trading outcomes differ across commodity and differentiated product markets?

This research draws upon literature on experimental economics, economics of electronic commerce, and intelligent agents to provide the theoretical bases¹ for examining the impact of intelligent agents on *market trading outcomes* in four settings: a single-source electronic sales channel dealing in commodity goods; a single-source electronic sales channel dealing in differentiated goods; an electronic market dealing in commodity goods; and an electronic market dealing in differentiated goods. Figure 1 depicts the research design.

Market trading outcomes were measured in terms of market efficiency, buyer's percentage of the total surplus, and seller's percentage of the total surplus (Davis and Holt 1993). Total surplus extracted from buyer-seller transactions in a trading period is the sum of buyer and seller surpluses. Buyer surplus represents the difference between the reservation price that the buyer is willing to pay for each unit of a product and the actual price transacted. Seller surplus is the difference between the seller's revenue and the total opportunity costs of production of the products for sale. Market efficiency is the percentage of maximum total surplus extracted in a market. In competitive price theory, the predicted market efficiency is 100% where the trading maximizes all possible gains of buyers and sellers from an exchange (Davis and Holt 1993).

A controlled laboratory experiment, along the principles of valid economic experimentation (Davis and Holt 1993; Smith 1982), was designed and conducted to study the experimental market performance and the trading outcome of buyers and sellers. Subjects were information systems students taking an undergraduate introduction to marketing course.² A total of 192 voluntary subjects with no prior experience in economic experiment participation were randomly assigned to be either a buyer or a seller in a treatment group. Posted-offer auction was used as the market trading institution for all trading sessions. Posted-offer auction refers to the laboratory implementation of price-setting activity where sellers publicly post list prices on a take-it-or-leave-it basis. The market trading institution was implemented using WWW-based client-server and database technologies. Every buyer and seller in a treatment group for a particular experiment session had different cost and valuation parameters determined by the induced, upward-sloping supply and downward-sloping demand market structure.³ Experimental instructions and procedures⁴ were mostly adapted from Plott and Smith (1978).

We have conducted the experiments. We are currently in the process of consolidating and analyzing the data. Results of our data analyses and implications for research and practice in electronic commerce will be presented at the Conference.

¹Owing to space constraint, the detailed arguments of the research model will be presented during the Conference.

²We would like to gratefully acknowledge the support of Drs. Ooi Beng Chin and Goh Cheng Hian by giving us access to the students.

³Given the space constraint, details of the supply and demand market structure will not be discussed here. They can be obtained from the authors on request (teohh@comp.nus.edu.sg).

⁴Given the space constraint, the experimental instructions and procedures will be presented at the Conference.

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